

Today's Presentation

- Summary of responses to public comment.
- Brief overview of findings from the final Integrated Assessment.
- Wrap up this phase and move on to development of the Action Plan.

Overview of IA Development

- Reports written by 6 teams of experts were peer-reviewed.
 - posted on web and made available for public comment
 - received comments from 34 organizations and individuals
- Six reports and comments were used to draft the IA.
 - posted on web and made available for public comment
 - received comments from 16 organizations and individuals
- Those comments were also considered in completing the IA.
 - responses to both sets of comments posted on web
- Gulf Hypoxia web page: <http://WWW.NOS.NOAA.GOV>

8 Categories of Comments

- IA and Action Plan development process.
- Adaptive management, monitoring, research.
- Modeling of management options and impacts.
- International and national hypoxia comparisons.
- Factors contributing to hypoxia.
- Trends and sources of nitrogen.
- History of Gulf hypoxia.
- Nutrient control practices.

Contributing Factors (comments)

- Importance of agricultural nutrients overstated.
- Other factors dismissed or minimized.
 - terrestrial organic carbon
 - atmospheric deposition
 - modifications of the Mississippi River channel
 - coastal wetland loss
 - intrusions of deeper offshore waters
 - short- or long-term climate changes

Contributing Factors (response)

- Ensured that all relevant sources were addressed and quantified in the IA.
- Held science meeting to reexamine relative importance of factors contributing to hypoxia.

Reviews supported the conclusion that the primary cause of hypoxia in the Gulf of Mexico is **excess nitrogen delivered from the MS-Atchafalaya River drainage basin**, in combination with the stratification of Gulf waters.

Gulf Hypoxia web page: <http://WWW.NOS.NOAA.GOV>

Trends and Sources of Nitrogen (comments)

- Total N flux has decreased, rather than increased.
- Lack of 1999 flux data.
- Lack of emphasis on N removed via crops.
- Contributions of non-agricultural sources skewed.

Trends and Sources of Nitrogen (responses)

- Significant new data analyzed and incorporated into the IA:
 - new information on historic and recent river N concentrations.
 - 1999 N concentration and flux relative to large 1999 hypoxic zone.
 - statistical relationships among nitrate flux, fertilizer use, stream flow, and residual nitrogen.
- This new analysis:
 - confirmed the increasing nitrate trend.
 - supported connection between fertilizer use and nitrate flux.
- Recognized significance of N removed in harvested crops.

History of Gulf Hypoxia (comments)

- Hypoxia is a naturally occurring phenomenon.
- Primary productivity has decreased, not increased.
- Additional historical data needed to analyze extent and location of the hypoxic zone.

History of Gulf Hypoxia (responses)

- Recognized that hypoxia can occur naturally.
- Dec. 3 science meeting concluded no natural phenomena can explain the increase in size and persistence of hypoxic zone.
- Re-examined primary productivity data and found it correct.

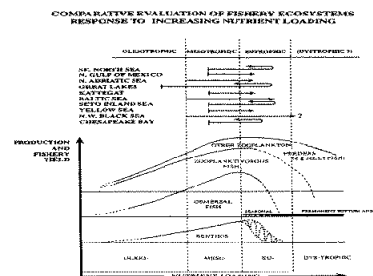
Nutrient Control Practices (comments)

- Importance of overland flow, groundwater discharge, and tile drains are under-represented.
- Contributions from Confined Animal Feeding Operations (CAFOs) were incompletely examined.
- The potential for improved nitrogen management in agriculture was not fully evaluated; farm-to-basin scale issues.
- Altering flows to the Gulf through the MS and Atchafalaya River outlets should be considered.

Nutrient Control Practices (responses)

- Acknowledged the importance of overland flow, groundwater discharge, and tile drains in N dynamics.
- Clarified differences between feedlot runoff and manure management and sent management suggestions to TF.
- Emphasized importance of local conditions in developing a program to reduce nitrogen losses to the Gulf.
- Included discussion of altering flows to the Gulf through the MS and Atchafalaya River outlets.

IA Findings



IA Findings

- Hypoxia has increased since the 1950's.
- River N load is dominant driver of hypoxia.
 - N, P, Si interactions are important.
- N load has more than tripled since 1950's
 - over 90% of N inputs to basin are from non-point sources.
 - about 56% of nitrate enters system north of Ohio River.
 - 34% enters from the Ohio River.

IA Findings

- Gulf hypoxia and basin water quality should respond positively to reduced loads.
- Two categories of action are key:
 - increase rates of denitrification
 - decrease N loads to surface waters

Potential Approaches to Increasing Denitrification

<u>Approach</u>	<u>Potential Nitrogen Reduction (Thousand of metric tons/yr)</u>
Creating and Restoring Wetlands 5-15 million acres	300 – 800
Creating and Restoring Riparian Buffers 19-48 million acres	300 – 800
Diverting Rivers in Coastal Louisiana 13-26% over 1.2 million acres	50 – 100

Potential Approaches to Reducing Nitrogen Inputs

<u>Approach</u>	<u>Potential Nitrogen Reduction (Thousand of metric tons/yr)</u>
Changing Farm Practices	
Nitrogen management	900 – 1,400
Alternative cropping systems	500
Reduction in Point Sources	
Tertiary treatment of domestic wastewater	20

Summary of Economic Costs of N-loss Reduction

<u>Scenario</u>	<u>N-Loss Reduction (Thousand metric tons/yr)</u>	<u>Unit Cost (\$/kg N-Loss)</u>	<u>Net Cost (\$/kg N-Loss)</u>
Edge-of-field N-loss reductions			
20%	941	0.88	0.80
30%	1,412	1.90	1.80
40%	1,882	3.37	3.25
Fertilizer reductions:			
20%	503	0.69	0.67
45%	1,027	2.85	2.81
Wetlands: 1M acres	67	6.06	-2.19
5M acres	350	8.90	1.00
10M acres	713	10.57	2.81
Riparian buffers (19M acres)	692	26.03	
River diversion to coastal wetlands	75	~6	
Tertiary treatment/waste water	20	~40	

In Summary

- Based on wide participation, peer-review, and focused attention to resolve key controversies.
- Describes effectiveness and approaches of a wide range of possible actions.
- Strong science base for action.
- Only ONE recommendation.
 - Adaptive management approach that includes adequate environmental monitoring and research.